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SWEET SORGHUM IN THE LOWER RIO GRANDE VALLEY OF TEXAS

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SWEET SORGHUM IN THE LOWER RIO GRANDE VALLEY OF TEXAS[1/]

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Farmers in the Rio Grande Valley are interested in sweet sorghum as a new crop for production of sugar, sirup, and livestock feed. Climatic conditions make the valley area ideal for developing new crop enterprises. The subtropical, subhumid area with a year-round growing season and varied climatic conditions contains 700,000 irrigated and 200,000 nonirrigated acres of fertile cropland. Water for irrigation is available from nearby Falcon Reservoir and from wells.

Although cotton is the major source of cash income, livestock and livestock products rank a close second. Valley growers want a supplementary crop that can be harvested in the summer and utilized in the expanded beef and dairy enterprises. Sweet sorghum is a promising crop for that purpose; it produces large yields of high-quality ensilage per acre. In addition, it has a valuable potential as a source of sirup and sugar (fig. 1).

New improved varieties of sweet sorghum have become available during recent years. Plant breeders of the Crops Research Division, Agricultural Research Service, U.S. Department of Agriculture at Beltsville, Md., and at Meridian, Miss., have developed these improved varieties through hybridization of germ plasm collected from all parts of the world.

The best commercial varieties and new lines from these crosses were made available in 1961 and 1962 for testing at two sites in the Lower Rio Grande Valley at Substation No. 15 of the Texas Agricultural Experiment Station.[3/] Some general information about adaptation of the crop indicates that sweet sorghum can be planted from March 15 to September 1 with a reasonable expectation of normal yields.

1/ Cooperative investigations between the Crops Research Division, Agricultural Research Service, USDA, and the Texas Agricultural Experiment Station.

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3/ The authors acknowledge the cooperation of O. H. Coleman in furnishing seed and recommendations for this research.

Figure 1.--Sweet sorghum varieties in an experiment at Weslaco, Tex.

EXPERIMENTAL PROCEDURE

Seedbeds for the experiments were prepared far enough in advance of planting to become firm and to permit decomposition of the previous crop's residue. Rows were spaced 38 inches apart. Nitrogen was applied at the rate of 60 pounds per acre to the side and below the seed zone at the time of planting.

Seed were planted in March in a moist seedbed at the rate of approximately 5 pounds per acre. Weeds were controlled by sweep cultivation. Irrigation water was applied three times during the growing season (preboot, late-boot, and bloom stages) to coincide with the period of high moisture requirements. Each crop was harvested when the seed were in the firm dough stage of maturity. The time of harvest ranged from late June to early July for most varieties. Some of the slow-maturing varieties were harvested later.

The experimental design for all experiments was a randomized block with each variety replicated four times in 1/200-acre plots. Field samples comprising 15 stalks were selected at random from each plot for sugar analyses. Leaves, peduncles, and heads were removed to obtain the net weight of stripped stalks.

The field samples were milled in a laboratory-scale, 3-roller mill. Weights of juice and bagasse were obtained from each sample. Representative lots of juice from each sample were used for Brix, sucrose, and purity determinations. Yields of sugar per ton of stalks and per acre were calculated by the Winter-Carp-Geerlings formula.4/

DISCUSSION OF RESULTS

Total and net (stripped) yields of stalks, analytical data, and calculated yields of sugar from three sweet sorghum experiments are shown in tables 1 to 3. Experiments were conducted at the Texas Agricultural Experiment Station, Substation No. 15, near Weslaco, Tex., on Willacy fine loam in 1961 and 1962; one was conducted at San Benito, Tex., on Cameron clay in 1962. The experiments included (1) current or former commercial varieties having high sugar content, (2) commercial varieties used for sirup and feed production, and (3) new selections from the U.S. Department of Agriculture's breeding program.

High sugar types

Brawley, one of the important commercial varieties for feed production in southern California, produced an average yield of 12.71 tons (net) of stalks and 2,257 pounds of sugar per acre at Weslaco in 1961 and 1962 (tables 1 to 3). The average yield of sugar per ton of stalks was 177.8 pounds. Yields of Brawley at San Benito in 1962 were approximately the same as those at Weslaco.

Collier-MN 45, formerly an important commercial variety in Kansas and other dryland areas, produced approximately the same yield of stalks and sugar as Brawley at Weslaco in 1961 and 1962 and at San Benito in 1962 (tables 1 to 3). Both varieties are susceptible to most diseases of the crop.

Rex, one of the varieties used formerly in sugar-manufacturing studies, produced approximately the same yield of sugar per acre as Brawley and Collier; it produced higher yields of stalks per acre at Weslaco in 1961 and at San Benito in 1962 but less sugar per ton of stalks.

Collier-706 C, developed as a high sucrose type in Kansas, produced a low yield of stalks; it had a low sugar content under conditions at Weslaco in 1961. Yields of stalks per acre were also low (table 1).

4/ Spencer, G. L., and Meade, G. P., Cane Sugar Handbook. 8th Ed. 834 pp. 1945.

Sirup types

Tracy, one of the midseason-maturing varieties used for sirup production in the Southeastern States, produced favorable yields of stalks at Weslaco in 1961; but the yield of sugar was too low for sugar production (table 1). The variety is susceptible to the common sorghum diseases.

Honey Drip is not now used extensively for sirup production because of low yields; it was unsatisfactory for sugar production at Weslaco in 1961 (table 1).

Sart, a late-maturing variety for sirup production in the Southeastern States, produced favorable yields of stalks at Weslaco in 1962 (table 2); the sucrose content was too low for sugar production. Sart is a promising variety for sirup and feed production.

The two forage-type varieties, Beef Builder T and Titan, produced favorable total yields of stalks. Net yields of stalks and sugar content were too low for sugar production; these varieties may have favorable qualities for feed (table 2).

New strains

Six new strains - Mer. numbers 55-1, 57-1, 58-2, 60-9, 61-3, and 61-7 - were evaluated in the experiments. Mer. 55-1 was in the two experiments at Weslaco and the one at San Benito; other strains were in one experiment at each location.

Mer. 55-1 is the most promising new strain for sugar production in the Rio Grande Valley. Average yields of sugar per ton of stalks ranged from 208.9 pounds at Weslaco to 239.4 pounds at San Benito, in 1962. Yields of sugar per acre ranged from 2,795 pounds at Weslaco in 1962 to 4,173 pounds at San Benito the same year. Mer. 55-1 is resistant to most diseases of sweet sorghum. Growth characteristics are favorable for machine harvesting. Release of this outstanding strain as a new variety is pending.

Mer. 57-1 produced favorable yields of stalks and sugar at Weslaco and at San Benito in 1962. Yields of sugar per ton of stalks were lower than those from Mer. 55-1. Further data are needed to evaluate Mer. 57-1 for commercial culture (table 3).

Preliminary data indicate that Mer. numbers 58-2, 60-9, 61-3, and 61-7 produced high yields of stalks in the valley; however, variations in sugar production indicate the need for additional information about the varieties for more conclusive evaluations.

Table 1.--Results of a sweet sorghum variety test, Weslaco, Tex., 1961

Variety or strain	Yield of stalks per acre		Laboratory mill juice analyses			Yield of sugar	
	Gross	Stripped	Brix	Sucrose	Purity	Per ton	Per acre
	Tons	Tons	Degrees	Percent	Percent	Pounds	Pounds
Brawley	18.07	12.88	14.12	11.38	80.6	156.5	2,016
Collier-MN 45	16.51	11.59	16.40	12.45	75.9	165.4	1,917
Collier-706 C	12.31	8.64	12.85	9.62	75.0	127.5	1,102
Honey Drip	13.37	7.68	10.50	6.02	55.4	30.0	203
Mer. 55-1	23.31	16.74	18.80	15.20	80.8	209.5	3,507
Rex	19.65	14.44	12.10	9.20	75.9	122.3	1,766
Tracy	20.75	16.48	13.50	7.50	55.4	82.1	1,353
L.S.D. 0.05	---	1.35	---	---	---	36.6	435
0.01	---	1.86	---	---	---	50.1	596

Table 2.--Results of a sweet sorghum variety test, Weslaco, Tex., 1962

Variety or strain	Yield of stalks per acre		Laboratory mill juice analyses			Yield of sugar	
	Gross	Stripped	Brix	Sucrose	Purity	Per ton	Per acre
	Tons	Tons	Degrees	Percent	Percent	Pounds	Pounds
Mer. 61-7	32.69	22.39	17.0	12.71	74.8	167.2	3,744
Mer. 58-2	31.73	21.16	17.7	12.59	71.1	160.3	3,392
Mer. 61-3	27.73	18.38	17.6	13.19	74.9	173.8	3,194
Sart	28.14	18.77	17.4	7.63	43.8	55.5	1,042
Rex	22.01	16.55	18.3	13.02	71.1	165.8	2,744
Mer. 57-1	21.78	16.12	17.2	13.63	79.3	185.8	2,995
Mer. 60-9	21.98	15.50	14.6	10.52	72.0	135.1	2,094
Collier-MN 45	21.42	14.63	18.9	13.86	73.3	180.1	2,635
Mer. 55-1	23.39	13.38	20.6	15.69	76.2	208.9	2,795
Beef Builder T	21.04	12.92	15.7	7.47	47.6	62.7	810
Brawley	18.89	12.54	18.8	14.72	78.3	199.2	2,498
Titan	20.72	11.60	10.6	5.13	48.4	44.2	513
L.S.D. 0.05	---	1.96	---	---	---	40.8	813
0.01	---	2.58	---	---	---	53.6	1,068

Table 3.--Results of a sweet sorghum variety test, San Benito, Tex., 1962[1/]

Variety or strain	Yield of stalks per acre		Laboratory mill juice analyses			Yield of sugar	
	Gross	Stripped	Brix	Sucrose	Purity	Per ton	Per acre
	Tons	Tons	Degrees	Percent	Percent	Pounds	Pounds
Mer. 61-7	35.15	27.41	18.9	3.03	16.0	----	----
Mer. 61-3	38.20	26.21	18.1	7.09	39.2	39.5	1,035
Mer. 58-2	40.45	26.16	17.3	----	----	----	----
Mer. 55-1	27.57	17.43	23.9	18.07	75.6	239.4	4,173
Mer. 60-9	25.50	16.48	23.1	8.09	35.0	29.8	491
Mer. 57-1	18.90	12.56	18.1	13.28	73.4	172.6	2,168
Rex	19.30	11.99	22.1	16.47	74.5	216.3	2,593
Collier-MN 45	20.35	11.37	23.1	16.95	73.4	220.3	2,505
Brawley	18.25	10.64	23.0	17.65	76.7	236.0	2,511
L.S.D. 0.05	----	4.31	----	----	----	42.7	659
0.01	----	5.85	----	----	----	58.5	902

1/ Data collected by J. Neal Pratt.